FIG. 1

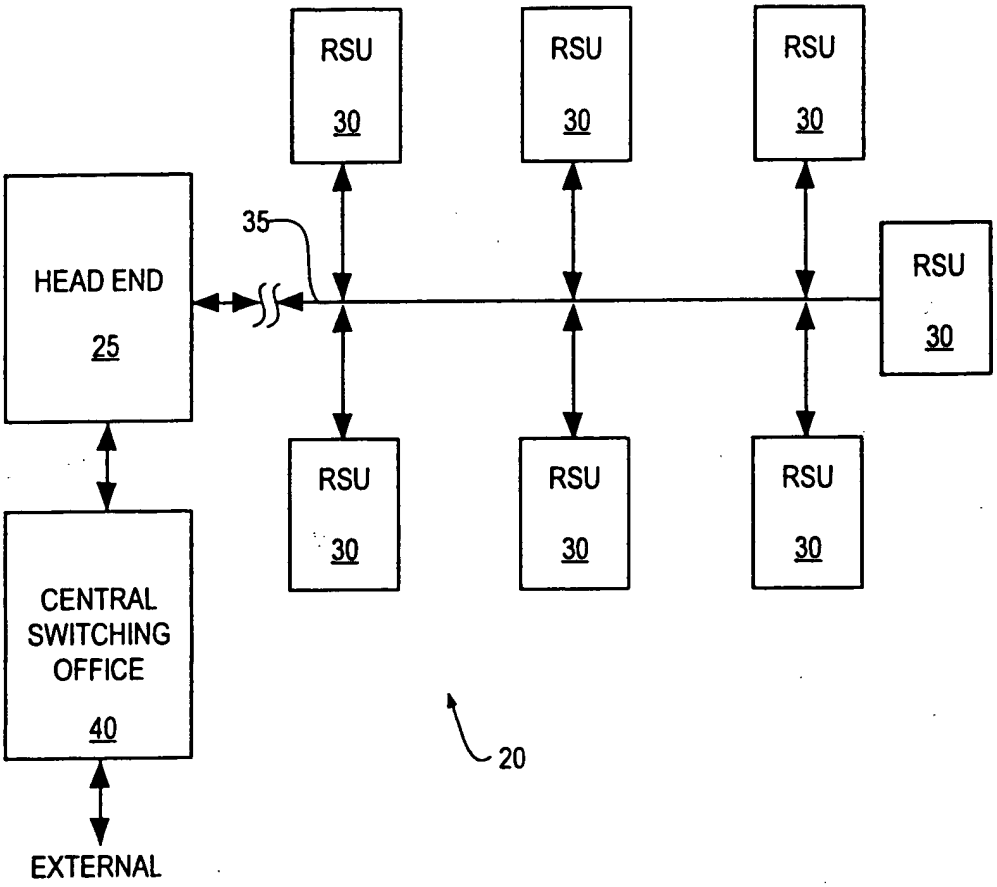

RSU
30
RSU
30
RSU
30
35
HEAD END
25
RSU
30
RSU
30
RSU
30
RSU
30
CENTRAL
SWITCHING
OFFICE
40
20
EXTERNAL

FIG. 2

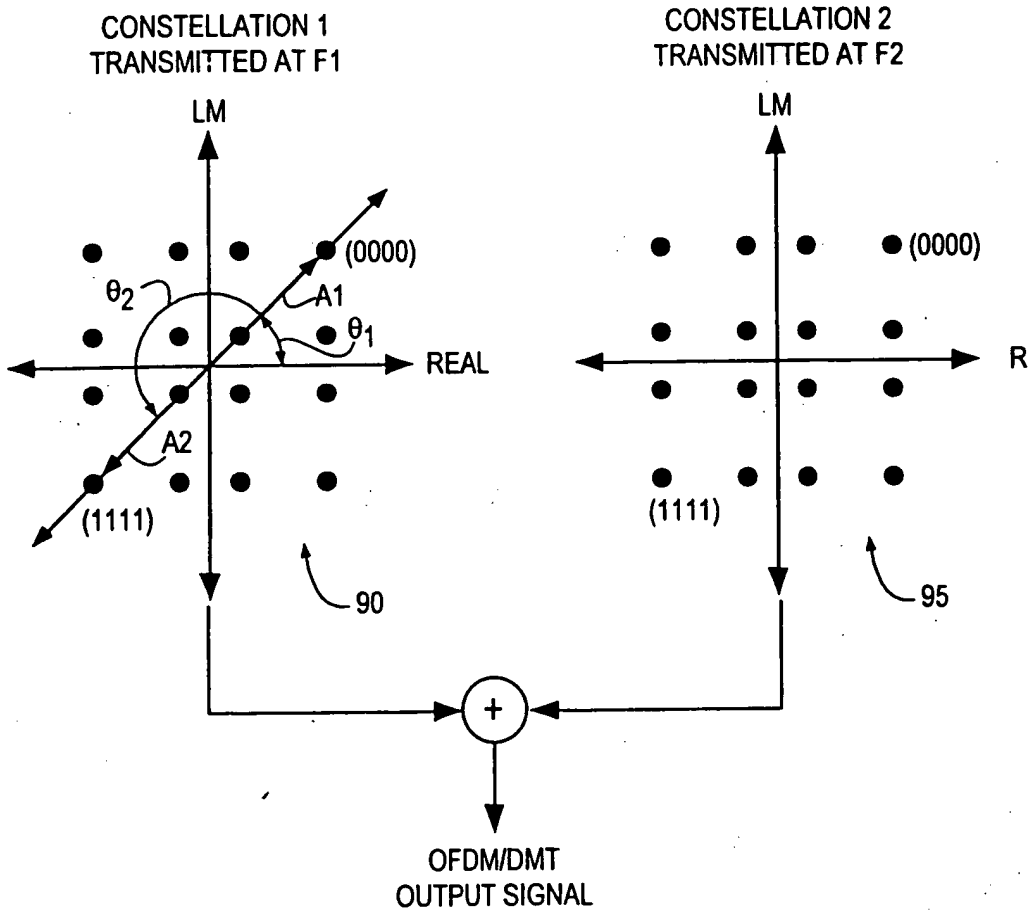

CONSTELLATION 1
TRANSMITTED AT F1
LM
(0000)
θ2
A1
θ1
REAL
A2
(1111)
90
CONSTELLATION 2
TRANSMITTED AT F2
LM
(0000)
R
(1111)
95
+
OFDM/DMT
OUTPUT SIGNAL

FIG. 3

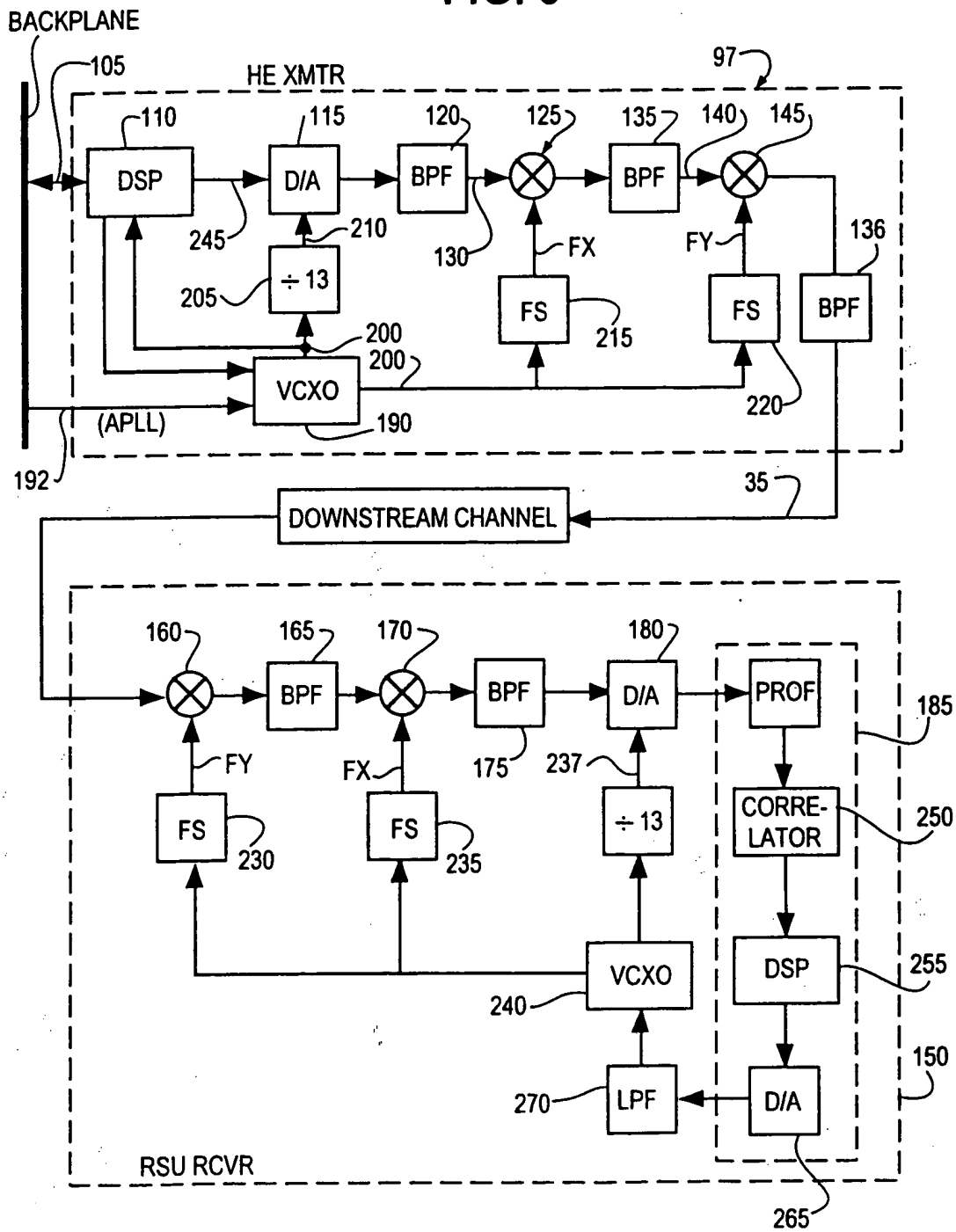
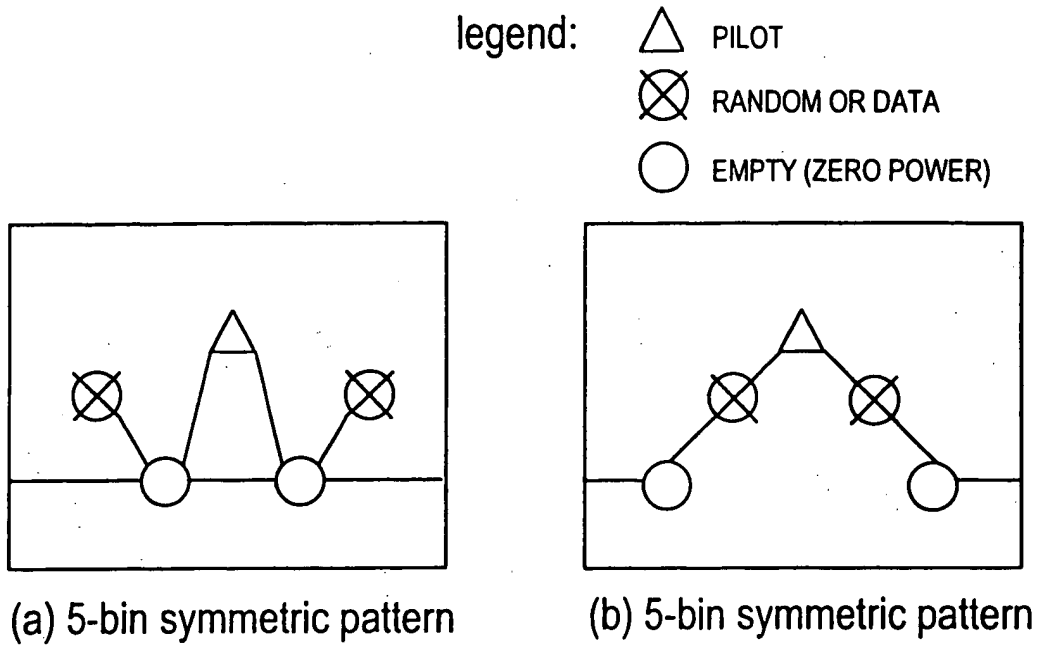

BACKPLANE
105
HE XMTR
97
110
115
120
125
135
140
145
DSP
D/A
BPF
BPF
245
210
130
FX
FY
136
÷ 13
205
FS
215
FS
BPF
200
200
VCXO
220
(APLL)
190
192
35
DOWNSTREAM CHANNEL
160
165
170
180
BPF
BPF
D/A
PROF
185
FY
FX
175
237
FS
230
FS
235
÷ 13
CORRE-
LATOR
250
VCXO
DSP
255
240
150
270
LPF
D/A
RSU RCVR
265

FIG. 4



(a) 5-bin symmetric pattern

(b) 5-bin symmetric pattern

(ac) 5-bin asymmetric pattern

(d) 6-bin asymmetric pattern

FIG. 5

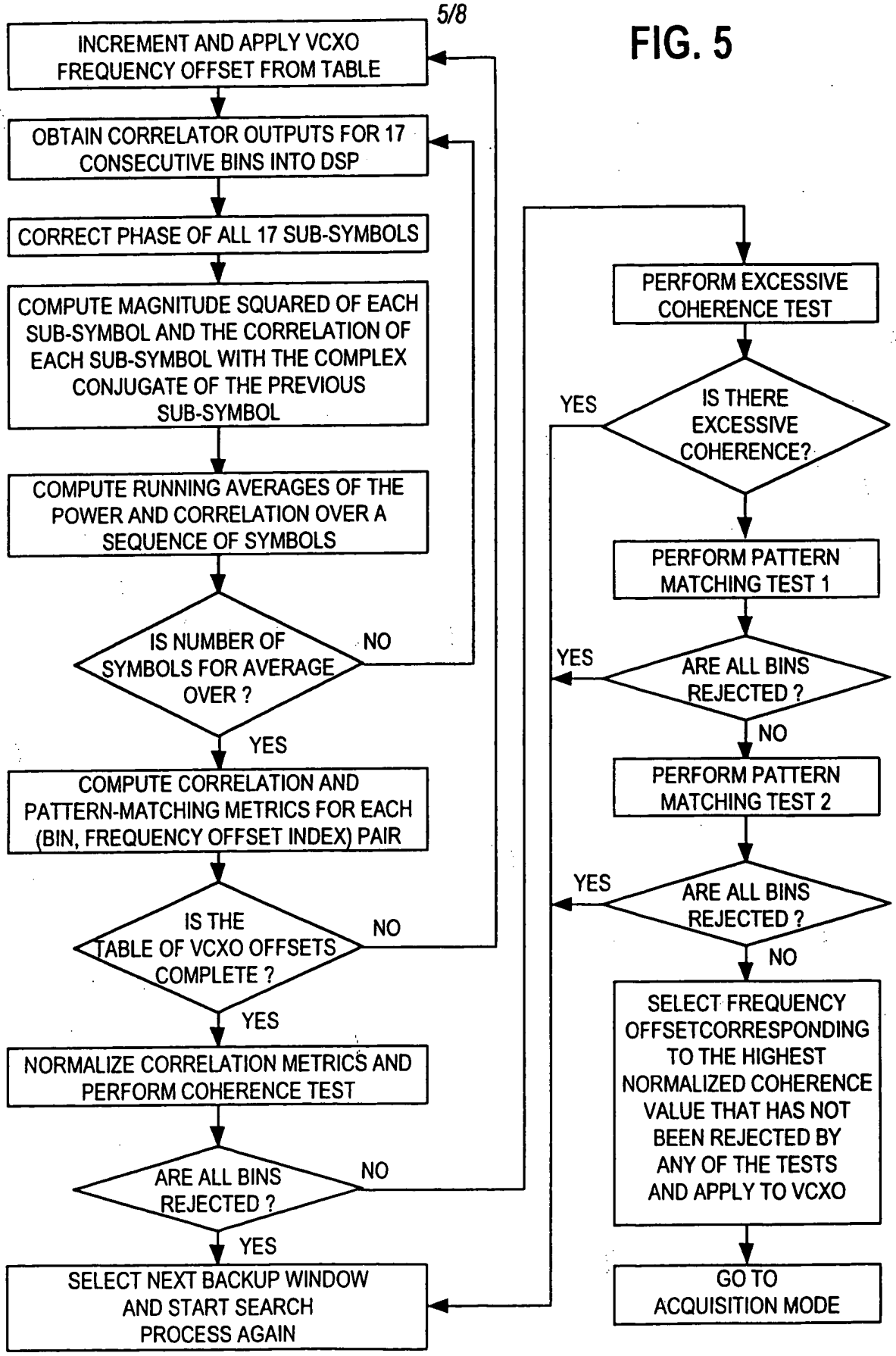

INCREMENT AND APPLY VCXO FREQUENCY OFFSET FROM TABLE
OBTAIN CORRELATOR OUTPUTS FOR 17 CONSECUTIVE BINS INTO DSP
CORRECT PHASE OF ALL 17 SUB-SYMBOLS
COMPUTE MAGNITUDE SQUARED OF EACH SUB-SYMBOL AND THE CORRELATION OF EACH SUB-SYMBOL WITH THE COMPLEX CONJUGATE OF THE PREVIOUS SUB-SYMBOL
COMPUTE RUNNING AVERAGES OF THE POWER AND CORRELATION OVER A SEQUENCE OF SYMBOLS
IS NUMBER OF SYMBOLS FOR AVERAGE OVER ?
NO
YES
COMPUTE CORRELATION AND PATTERN-MATCHING METRICS FOR EACH (BIN, FREQUENCY OFFSET INDEX) PAIR
IS THE TABLE OF VCXO OFFSETS COMPLETE ?
NO
YES
NORMALIZE CORRELATION METRICS AND PERFORM COHERENCE TEST
ARE ALL BINS REJECTED ?
NO
YES
SELECT NEXT BACKUP WINDOW AND START SEARCH PROCESS AGAIN
PERFORM EXCESSIVE COHERENCE TEST
IS THERE EXCESSIVE COHERENCE?
YES
PERFORM PATTERN MATCHING TEST 1
ARE ALL BINS REJECTED ?
YES
NO
PERFORM PATTERN MATCHING TEST 2
ARE ALL BINS REJECTED ?
YES
NO
SELECT FREQUENCY OFFSETCORRESPONDING TO THE HIGHEST NORMALIZED COHERENCE VALUE THAT HAS NOT BEEN REJECTED BY ANY OF THE TESTS AND APPLY TO VCXO
GO TO ACQUISITION MODE

FIG. 6

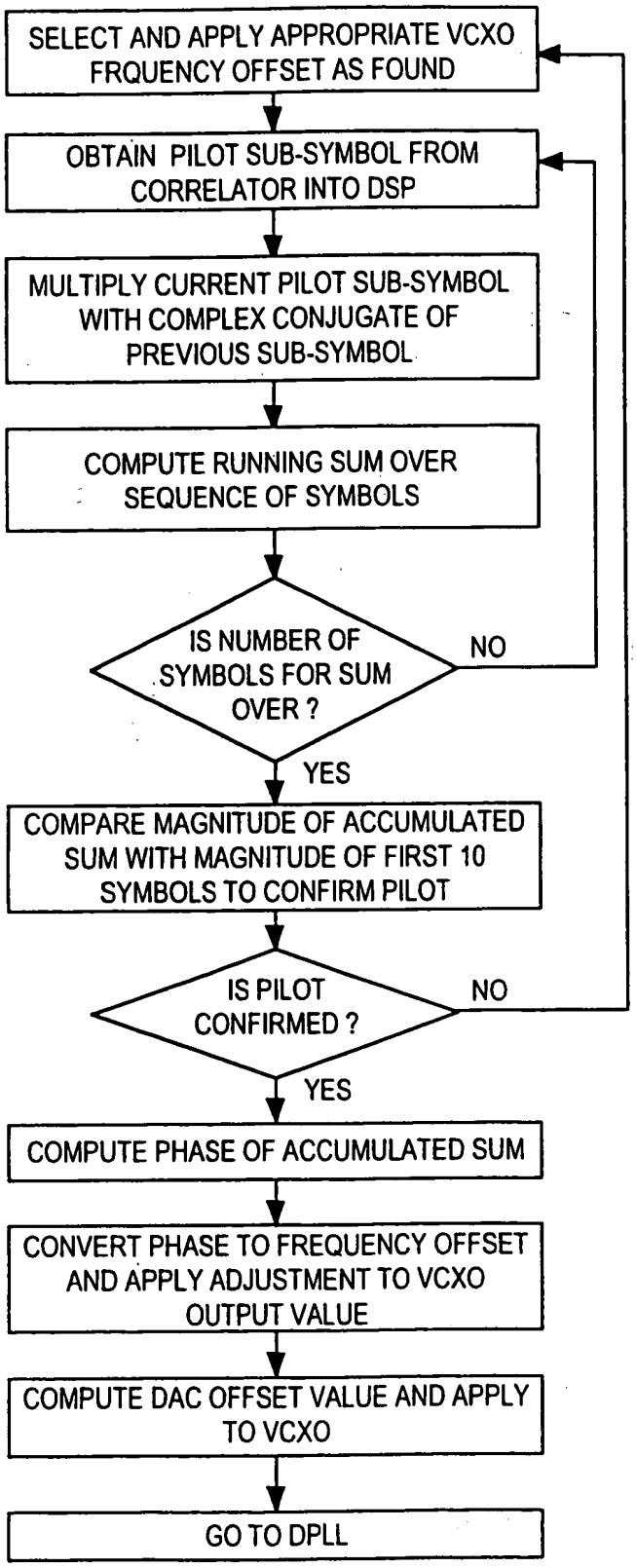

SELECT AND APPLY APPROPRIATE VCXO FRQUENCY OFFSET AS FOUND
OBTAIN PILOT SUB-SYMBOL FROM CORRELATOR INTO DSP
MULTIPLY CURRENT PILOT SUB-SYMBOL WITH COMPLEX CONJUGATE OF PREVIOUS SUB-SYMBOL
COMPUTE RUNNING SUM OVER SEQUENCE OF SYMBOLS
IS NUMBER OF SYMBOLS FOR SUM OVER ?
NO
YES
COMPARE MAGNITUDE OF ACCUMULATED SUM WITH MAGNITUDE OF FIRST 10 SYMBOLS TO CONFIRM PILOT
IS PILOT CONFIRMED ?
NO
YES
COMPUTE PHASE OF ACCUMULATED SUM
CONVERT PHASE TO FREQUENCY OFFSET AND APPLY ADJUSTMENT TO VCXO OUTPUT VALUE
COMPUTE DAC OFFSET VALUE AND APPLY TO VCXO
GO TO DPLL

FIG. 7

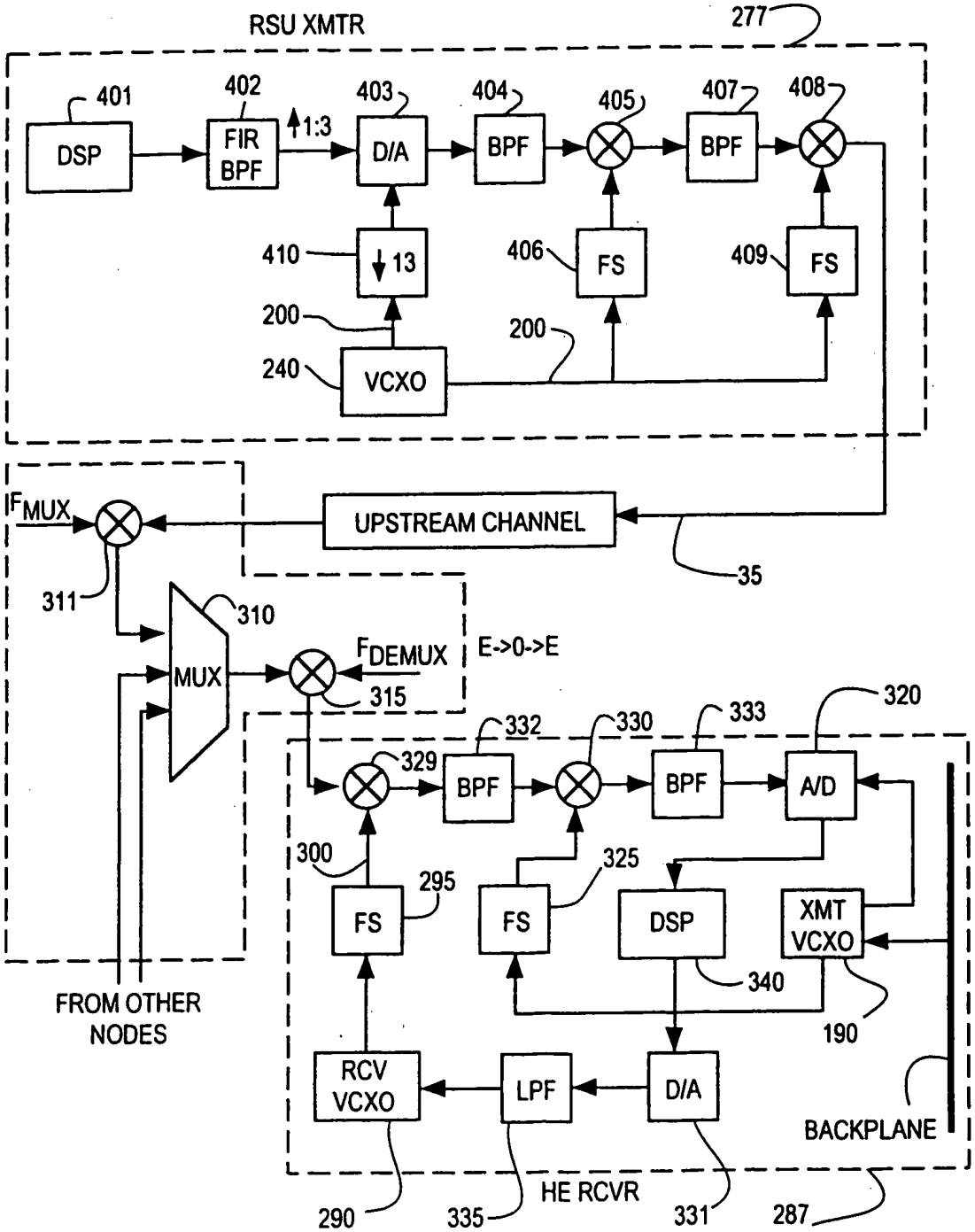
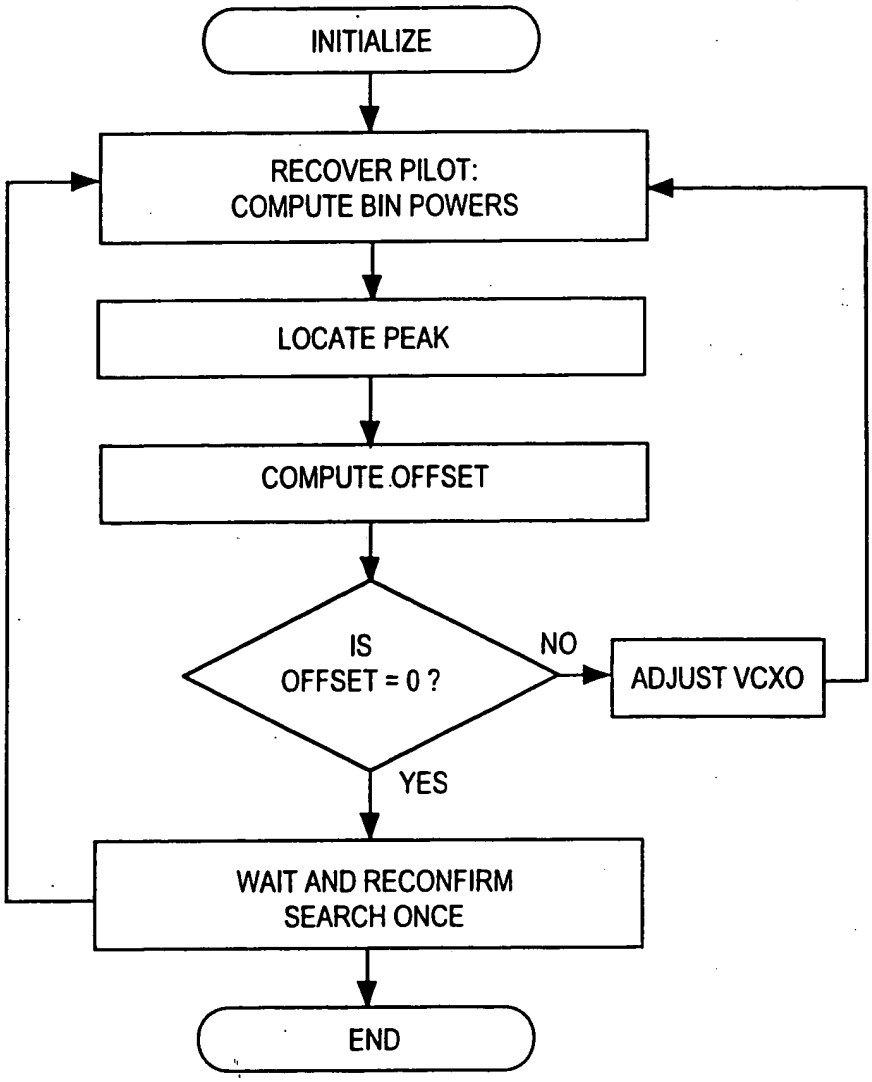

RSU XMTR
277
401
DSP
402
FIR BPF
1:3
403
D/A
404
BPF
405
407
BPF
408
410
13
406
FS
409
FS
200
200
240
VCXO
F MUX
UPSTREAM CHANNEL
35
311
310
MUX
F DEMUX
E->O->E
315
320
332
330
333
329
BPF
BPF
A/D
300
295
325
FS
FS
DSP
XMT VCXO
340
190
FROM OTHER NODES
RCV VCXO
LPF
D/A
BACKPLANE
290
335
HE RCVR
331
287

FIG. 8


INITIALIZE
RECOVER PILOT:
COMPUTE BIN POWERS
LOCATE PEAK
COMPUTE OFFSET
IS
OFFSET = 0 ?
NO
ADJUST VCXO
YES
WAIT AND RECONFIRM
SEARCH ONCE
END